

IF to IF Simulation of Wireless Links Using Commercial CAD Software

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Abstract

This work explores, by way of example, the application of modern CAD software to the simulation of RF communication system hardware. We restrict attention to the front-end analog portions of a typical communication link; that is, our coverage is from IF-to-IF. A 915 MHz breadboard system is used in a case study that compares measurements and simulations of various receiver and transmitter sub-system scenarios; the IF frequency is 70 MHz for both sub-systems. Performance parameters examined for the transmitter and receiver sub-systems include small signal frequency response, 1 dB gain compression power levels, and third-order-intercept (TOI). In addition, simulated and measurements for the receiver noise figure are compared. Finally, the transmitter and receiver are connected together with a variable attenuator to examine overall link performance, while leaving free-space propagation and channel modeling issues for future work. It is shown that after “calibrating” the system CAD representations of the transmitter and receiver sub-systems using component behavior, good predictions of in-band performance can be achieved for all parameters examined. The differences between CAD library (ideal) filters and measured filters can cause significant out-band discrepancies between simulated and measured sub-system behavior.